Project title:	AdaNowo – Adaptive, self-optimizing nonwoven production based on Reinforcement Learning.
Partner:	MAT Solutions GmbH, Mönchengladbach atlan-tec Systems GmbH, Willich BNP Brinkmann GmbH & Co. KG, Hörstel
Duration:	04/2022 - 04/2025
Funding Agency:	BMBF – German Federal Ministry of Education and Research

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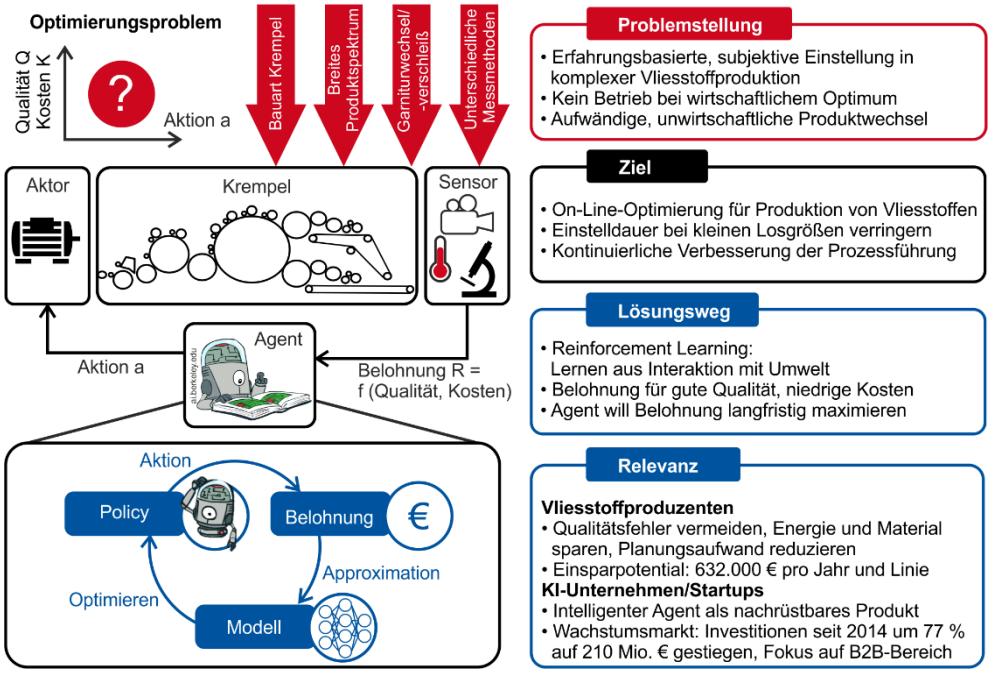
Mission Statement

Process operation in textile production processes – especially nonwoven production – is a complicated process in which the operator is confronted with numerous, sometimes contradictory tasks. An operator is quickly overwhelmed by the flood of information, resulting in rejects or wasted material and energy, as well as suboptimal product quality. The shortage of skilled workers, increasing flexibility towards raw materials used (natural raw materials, recycled materials) and a great dynamism of the markets pose extraordinary challenges to companies. These companies must react flexibly, quickly and with consideration of economic criteria in order to remain competitive.
The AdaNowo project responds to these challenges by enabling the machines involved in textile production, using nonwoven production as an example, to autonomously adjust and optimize themselves, taking into account several targets. The goal is to increase profitability, which includes both yield and variable costs of production. It also improves the learning rate (the rate at which profitability is increased when a product is changed).

Approach

Reinforcement learning (RL) is used, which, in contrast to other machine learning methods, is characterized by an interaction with the environment. An RL agent interacts with its environment with the goal of maximizing a reward signal in the long run, which is a function of the quality produced as well as the cost incurred. The distinctive feature of RL is that unknown but promising process settings are cautiously explored, so that a long-term improvement in process performance can be expected. In addition, the agent can learn to react to certain disturbing influences with certain actions and to compensate for disturbances.
With the help of the VDI standard 2206 for the development of cyber-physical systems, an RL agent including a virtual training environment is being developed. The virtual training environment allows the agent to be trained economically without the use of real resources. As a benchmark, the agent's

performance is compared to that of human operators on a real nonwoven line.



Acknowledgement

The authors would like to thank the German Federal Ministry of Education and Research for funding this research project.

GEFÖRDERT VOM
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